We claim:

1. A low temperature method for forming a thin gate oxide on a silicon surface, the method comprising:

providing a partially completed integrated circuit on a semiconductor substrate with a clean, atomically flat, silicon surface;

stabilizing the substrate at a first temperature no greater than about 200 degrees C;

exposing the silicon surface to an atmosphere including ozone, while maintaining the substrate at the first temperature, wherein the exposing step creates a first, uniformly thick, gate oxide film.

2. The method of Claim 1, wherein exposing the silicon surface to an atmosphere including ozone comprises:

exposing the silicon surface to an atmosphere including molecular oxygen, while irradiating at least a portion of the atmosphere with an ultraviolet light, the light operative to transform some of the oxygen to ozone.

3. The method of Claim 1, wherein the atmosphere further comprises molecular oxygen.

4. The method of Claim 1, wherein the atmosphere further comprises an inert gas.

5. The method of Claim 1, wherein exposing the silicon surface to an atmosphere including ozone includes exposing the silicon surface to an atmosphere with less energy than a plasma.

6. The method of Claim **5**, wherein at least part of the atmosphere that does not contact the silicon surface includes an ozone plasma.

7. The method of Claim 1, wherein the atomically flat, silicon surface is an atomically stepped surface.

8. The method of Claim 1, wherein the semiconductor substrate includes a plurality of clean, atomically flat, silicon surfaces.

9. The method of Claim 1, further comprising forming a gate electrode on the gate oxide film

10. The method of Claim 1, wherein the first temperature is about 25 degrees C and the oxide film has a thickness of about 10 angstroms.

11. The method of Claim 1, wherein the first temperature is between 0 and 200 degrees C and the oxide film has a thickness between 5 and 20 angstroms.

12. The method of Claim 1, wherein the first temperature is about 200 degrees C.

13. The method of Claim 1, wherein the first temperature is about 200 degrees C and the oxide film has a thickness of about 12 angstroms.

14. The method of Claim 1, further comprising:

determining a planned substrate temperature for a second oxide film formation, the planned temperature no greater than about 200 degrees C; thereby substantially determining a potential thickness of oxidizable silicon;

depositing a uniformly thick layer of silicon on the first oxide film to form a temporary silicon layer, the temporary silicon layer having a thickness no greater than the potential thickness of oxidizable silicon;

exposing the temporary silicon layer to a second atmosphere including ozone, while the substrate is at the planned substrate temperature,

wherein the exposing step oxidizes the temporary silicon layer to form a second, uniformly thick, oxide film extending to the first oxide film; thereby creating a combined, uniformly thick, oxide film.

15. The method of Claim 14, further comprising:

stabilizing the substrate at the planned substrate temperature before the exposing step.

16. The method of Claim 14, further comprising:

repeating the determining, depositing, and exposing at the planned temperature steps at least once; thereby increasing the thickness of the combined oxide film.

17. The method of Claim 14, wherein the first temperature and the planned temperatures are about 25 degrees C and the combined oxide film has a thickness of about 20 angstroms.

18. A low temperature method for forming a thin gate oxide on a silicon surface, the method comprising:

providing a partially completed integrated circuit on a semiconductor substrate with a clean silicon surface;

stabilizing the substrate at a first temperature no greater than about 200 degrees C;

exposing the silicon surface to an atmosphere including ozone, while maintaining the substrate at the first temperature, wherein the exposing step creates a first, uniformly thick, gate oxide film; and

forming a gate electrode on the oxide film.

19. The method of Claim 18, wherein the clean silicon surface is a hydrogen terminated silicon surface.

20. The method of Claim 18, further comprising:

determining a planned substrate temperature for a second oxide film formation, the planned temperature no greater than about 200 degrees C; thereby substantially determining a potential thickness of oxidizable silicon;

depositing a uniformly thick layer of silicon on the first oxide film to form a temporary silicon layer, the temporary silicon layer having a thickness no greater than the potential thickness of oxidizable silicon;

exposing the temporary silicon layer to a second atmosphere including ozone, while the substrate is at the planned substrate temperature,

wherein the exposing step oxidizes the temporary silicon layer to form a second, uniformly thick, oxide film extending to the first oxide film; thereby creating a combined, uniformly thick, oxide film.

21. The method of Claim 20, further comprising:

stabilizing the substrate at the planned substrate temperature before the exposing step.

22. The method of Claim 20, further comprising:

repeating the determining, depositing, and exposing at the planned temperature steps at least once; thereby increasing the thickness of the combined oxide film.

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